UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/623,281	11/21/2000	Stephen Alec Billings	12304-002001	2687

7590 05/03/2004

Fish & Richardson
225 Franklin Street
Boston, MA 02110-2804

EXAMINER	
THANGAVELU, KANDASAMY	
ART UNIT	**PAPER NUMBER**
2123	6

DATE MAILED: 05/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/623,281	BILLINGS ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 November 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 November 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-32 of the application have been examined.

Foreign Priority

2. Acknowledgment is made of applicant's claim for foreign priority based on United Kingdom patent Application 9804412.6 filed on march 3, 1998 and PCT patent Application PCT/GB99/00550 filed on March 2, 1999. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Duplicate Claims, Objection

3. Claim 31 is objected to under 37 CFR 1.75 as being a substantial duplicate of claims 11 to 19. Claim 32 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 20. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 10 and 30 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 10 states, "A method for realising or manufacturing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies" and "(b) materially producing the non-linear system so designed or using the non-linear system so designed to modify materially the transfer function of an existing linear or non-linear system".

However, the specification describes only the method of designing the a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies. It does not describe anywhere in the specification how the non-linear system is manufactured or realized, as the manufacture requires the hardware and software to manufacture and involves more steps than the steps involved in designing the system. It also does not describe anywhere how the non-linear system so designed is materially produced to modify

materially the transfer function of an existing linear or non-linear system. It is also not explained why a non-linear system so produced should modify the transfer function of an existing linear system.

Claim 30 states, "A non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies, said system comprising means for implementing a method as claimed in any of claims 1 to 9". However, the specification does not describe anywhere what the means for implementing the method as claimed in claims 1 to 9 are. If the system is to transfer energy from one time or spatial domain to another domain, then it not only requires a method for doing so, but also various hardware and software to implement the method and execute the method, so such transfer can take place. These means are not described using hardware and software components anywhere in the specification.

Claim Rejections - 35 USC § 101

6. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. Claims 1-9, 11-29 and 32 are rejected under 35 U.S.C. 101 because the claimed inventions are directed to non-statutory subject matter.

Method claims 1-9 are rejected for reciting a process that is not directed to the technological arts.

Regarding claim 1, this claim is directed at a method for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies, whereas none of the limitations describe any type of computer-implemented steps. To be statutory, the utility of an invention must be within the technological arts. *In re Musgrave*, 167 USPQ 280, 289-90 (CCPA, 1970). The definition of "technology" is the "application of science and engineering to the development of machines and procedures in order to enhance or improve human conditions, or at least to improve human efficiency in some respect." (Computer Dictionary 384 (Microsoft Press, 2d ed. 1994)).

Dependent claims 2-9 depend on Claim 1 but do not add further statutory steps.

The limitations recited in claims 1-9 contain no language suggesting these claims are intended to be within the technological arts.

Independent claim 11 recites a data processing system for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal raving a second spectrum at a second pre-determinable frequency or range of frequencies. The limitations recited in claim contain means for language suggesting only software components which are not statutory subject matter. To be statutory, the system should include computer

system hardware components which will be required to implement the software components.

Dependent claims 12-19 depend on Claim 11 but contain means for language suggesting only software components which do not add further statutory steps.

Independent claim 20 recites a computer program product for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies, the said product comprising a computer readable storage medium. The limitations recited in claim contain computer program code means for implementing the steps in claims 1-9 in the computer program which are not statutory subject matter. To be statutory, the computer product should include a program comprising instructions which when executed in a computer performs a process comprising the steps included in the limitations.

Dependent claims 21-28 depend on Claim 20 but contain computer program code means in a computer program product which do not add further statutory steps.

Independent claim 29 recites a non-linear system which can transfer energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies. The limitations recited in claim contain means for language suggesting only software components which are not statutory subject matter. To be statutory, the system should include computer system hardware and other

components which will be required to implement the software components.

Independent claim 32 recites an article of manufacture comprising a computer usable medium with computer readable program code means embodied in the medium for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies. The limitations recited in claim contain the computer readable program code means for implementing the steps in claim 1, which are not statutory subject matter. To be statutory, the article of manufacture should include a program comprising instructions which when executed in a computer performs a process comprising the steps included in the limitations.

8. Claims 1- 9 would be statutory if they are written as a computer implemented method for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies.

Claims 11 to 19 would be statutory if it is rewritten as:

A data processing system for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency

or range of frequencies to a time or spatial domain output signal raving a second spectrum at a second pre-determinable frequency or range of frequencies, comprising:

a processor to execute a program of instructions stored in the memory of the computer;

a memory to store a program of instruction for performing a method for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal raving a second spectrum at a second pre-determinable frequency or range of frequencies;

a display to display the results of the computer implemented method;

means for identifying or specifying the first spectrum of the time or spatial domain input signal from which energy is to be transferred;

.....

Claims 20-28 would be statutory if it is rewritten as:

A computer program product for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies, in a computer readable storage medium, comprising computer program instructions which when executed on a computer performs a process, the process comprising the steps of:

identifying or specifying the first spectrum of a time or spatial domain input signal from which energy is to be transferred;

....

Claim 29 would be statutory if the system would include the hardware components that would be required to realize the system.

Claim 32 would be statutory if it is written as described for Claim 29 above indicating the article of manufacture comprises computer readable program code comprising instructions, which when executed performs the method of claim 1.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

10. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1, 2, 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tong et al. (TO)** U.S. Patent 5,995,565) in view of **Keefe et al. (KE)** (U.S. Patent 5,885,225), and further in view of **Mansour et al. (MA)** ("Frequency domain non-linear adaptive filter", IEEE, 1981).

11.1 **TO** teaches co-channel interference reduction. Specifically, as per claim 1, **TO** teaches a method for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies (Abstract, L1-3; L7-11; CL1, L65 to CL2, L5; CL2, L31-60; CL3, L36-51; CL10, L9-16); the method comprising the steps of:

identifying or specifying the first spectrum of the time or spatial domain input signal from which energy is to be transferred (CL1, L65 to CL2, L5);

specifying the second spectrum of the time or spatial domain output signal to which the energy is to be transferred (CL1, L47-50; CL2, L6-16);

calculating the coefficients of the time or spatial domain description of the generalised nonlinear system in order to give effect to the energy transfer (Abstract, L7-11; CL2, L31-60; CL3, L48-51; Fig 1, Item 18; CL5, L39-44; CL10, L9-16; CL12, L21-45); and

calculating using a frequency domain description of the output signal, for example, the output spectrum (CL2, L31-41; CL10, L9-16).

TO does not expressly teach a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. **KE** teaches a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system (CL12, L3-11; CL16, L45-55), because as per **MA**, the frequency domain implementation offers a significant reduction in computation (Page 550, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **TO** with the method of **KE** that included a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. One would be motivated because the frequency domain implementation would offer a significant reduction in computation.

Per claim 2: **TO** teaches a selecting a time or spatial domain description of the generalised non-linear system (Fig. 6; CL6, L60-65);

determining or defining a frequency domain description of the time or spatial domain input for the generalised non-linear system (CL6, L35-43); and

determining or defining the frequency domain description of the output signal, for example, the output spectrum, of the generalised non-linear system (CL7, L61 to CL8, L15).

TO does not expressly teach a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. **KE** teaches a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system (CL12, L3-11; CL16, L45-55), because as per **MA**, the frequency domain implementation offers a significant reduction in computation (Page 550, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **TO** with the method of **KE** that included a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. One would be motivated because the frequency domain implementation would offer a significant reduction in computation.

Per claim 4: **TO** teaches determining a mapping between the time or spatial domain description of the generalised nonlinear system and the frequency domain description of the generalised nonlinear system (CL7, L61 to CL8, L15).

Per claim 6: **TO** teaches defining or determining a general relationship between the input and output frequency or frequency ranges of the generalised non-linear system (CL2, L31- L41).

12. Claims 10-12, 14, 16, 20, 21, 23, 25 and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tong et al. (TO)** U.S. Patent 5,995,565) in view of **Keefe et al. (KE)** (U.S. Patent 5,885,225), and further in view of **Mansour et al. (MA)** ("Frequency domain non-linear adaptive filter", IEEE, 1981) and **Pierce et al. (PI)** (U.S. Patent 5,703,313).

12.1 As per claim 10, **TO** teaches a method for realising or manufacturing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies (Abstract, L1-3; L7-11; CL1, L65 to CL2, L5; CL2, L31-60; CL3, L36-51; CL10, L9-16); the method comprising the steps of:

materially producing the non-linear system so designed or using the non-linear system so designed to modify materially the transfer function of an existing linear or non-linear system (CL1, L60-64).

TO does not expressly teach designing the non-linear system using the method as claimed in any of claims 1, 2, 4 and 6. **KE** teaches designing the non-linear system using the method as claimed in any of claims 1, 2, 4 and 6 (CL12, L3-11; CL16, L45-55), because as per **MA**, the frequency domain implementation offers a significant reduction in computation (Page 550, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **TO** with the method of **KE** that included designing the non-linear system using the method as claimed in any of claims 1, 2, 4 and 6. One

would be motivated because the frequency domain implementation would offer a significant reduction in computation.

12.2 As per claims 11, **TO** teaches a method for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal having a second spectrum at a second pre-determinable frequency or range of frequencies (Abstract, L1-3; L7-11; CL1, L65 to CL2, L5; CL2, L31-60; CL3, L36-51; CL10, L9-16); the method comprising the steps of:

identifying or specifying the first spectrum of the time or spatial domain input signal from which energy is to be transferred (CL1, L65 to CL2, L5);

specifying the second spectrum of the time or spatial domain output signal to which the energy is to be transferred (CL1, L47-50; CL2, L6-16);

calculating the coefficients of the time or spatial domain description of the generalised nonlinear system in order to give effect to the energy transfer (Abstract, L7-11; CL2, L31-60; CL3, L48-51; Fig 1, Item 18; CL5, L39-44; CL10, L9-16; CL12, L21-45); and

calculating using a frequency domain description of the output signal, for example, the output spectrum (CL2, L31-41; CL10, L9-16).

TO does not expressly teach a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system.

KE teaches a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system (CL12, L3-11; CL16, L45-55), because as per **MA**, the frequency domain implementation offers a significant reduction in computation (Page 550, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **TO** with the method of **KE** that included a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. One would be motivated because the frequency domain implementation would offer a significant reduction in computation.

TO does not expressly teach a data processing system for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal raving a second spectrum at a second pre-determinable frequency or range of frequencies, the system comprising means for identifying or specifying the first spectrum of the time or spatial domain input signal from which energy is to be transferred; means for specifying the second spectrum of the time or spatial domain output signal to which the energy is to be transferred; and means for calculating, using a frequency domain description of the output signal, for example, the output spectrum, expressed in terms of a frequency domain description of the input and coefficients of a time or spatial domain description of a generalised non-linear system, the coefficients of the time or spatial domain description of the generalised non-linear system in

order to give effect to the energy transfer. **PI** teaches data processing system for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal raving a second spectrum at a second pre-determinable frequency or range of frequencies(CL1, L50-57; Fig. 1; CL2, L50 to CL3, L47; CL1, L40-49); the system comprising means for identifying or specifying the first spectrum of the time or spatial domain input signal from which energy is to be transferred (CL1, L40-49); means for specifying the second spectrum of the time or spatial domain output signal to which the energy is to be transferred (CL1, L40-49); and means for calculating, the coefficients of the time or spatial domain description of the generalised non-linear system in order to give effect to the energy transfer (CL1, L58-64); and using a frequency domain description of the output signal, for example, the output spectrum, expressed in terms of a frequency domain description of the input and coefficients of a time or spatial domain description of a generalised non-linear system(Cl2, L50 to CL3, L47), because the processor means provide memory elements for retaining the energy state and processing capability for generating the modified energy signals from the received signals using appropriate method (CL1, L50-56).

It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **TO** with the system of **PI** that included data processing system for designing a non-linear system for transferring energy from a time or spatial domain input signal having a first spectrum at a first pre-determinable frequency or range of frequencies to a time or spatial domain output signal raving a second spectrum at a second pre-determinable frequency or range of frequencies, the system comprising means for identifying or specifying the

first spectrum of the time or spatial domain input signal from which energy is to be transferred; means for specifying the second spectrum of the time or spatial domain output signal to which the energy is to be transferred; and means for calculating, using a frequency domain description of the output signal, for example, the output spectrum, expressed in terms of a frequency domain description of the input and coefficients of a time or spatial domain description of a generalised non-linear system, the coefficients of the time or spatial domain description of the generalised non-linear system in order to give effect to the energy transfer. One would be motivated because the processor means would provide memory elements for retaining the energy state and processing capability for generating the modified energy signals from the received signals using appropriate method.

12.3 As per claim 12, **TO** teaches a selecting a time or spatial domain description of the generalised non-linear system (Fig. 6; CL6, L60-65);

determining or defining a frequency domain description of the time or spatial domain input for the generalised non-linear system (CL6, L35-43); and

determining or defining the frequency domain description of the output signal, for example, the output spectrum, of the generalised non-linear system (CL7, L61 to CL8, L15).

TO does not expressly teach a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. **KE** teaches a frequency domain description of the output signal, for example, the output

spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system (CL12, L3-11; CL16, L45-55), because as per **MA**, the frequency domain implementation offers a significant reduction in computation (Page 550, CL1, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **TO** with the method of **KE** that included a frequency domain description of the output signal, for example, the output spectrum expressed in terms of a frequency domain description of the input signal and coefficients of a time or spatial domain description of a generalised nonlinear system. One would be motivated because the frequency domain implementation would offer a significant reduction in computation.

TO does not expressly teach means for selecting a time or spatial domain description of the generalised non-linear system; means for determining or defining a frequency domain description of the time or spatial domain input for the generalised non-linear system; and means for determining or defining the frequency domain description of the output of the generalised non-linear system expressed in terms of the frequency domain description of the input signal and the coefficients of the time or spatial domain description of a generalised non-linear system. **PI** teaches means for selecting a time or spatial domain description of the generalised non-linear system (CL1, L58-64); means for determining or defining a frequency domain description of the time or spatial domain input for the generalised non-linear system (CL2, L50 to CL3, L47); and means for determining or defining the frequency domain description of the output of the generalised non-linear system expressed in terms of the frequency domain description of the

input signal and the coefficients of the time or spatial domain description of a generalised non-linear system (CL2, L50 to CL3, L47).

It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **TO** with the system of **PI** that included means for selecting a time or spatial domain description of the generalised non-linear system; means for determining or defining a frequency domain description of the time or spatial domain input for the generalised non-linear system; and means for determining or defining the frequency domain description of the output of the generalised non-linear system expressed in terms of the frequency domain description of the input signal and the coefficients of the time or spatial domain description of a generalised non-linear system. One would be motivated because the processor means would provide memory elements for retaining the energy state and processing capability for generating the modified energy signals from the received signals using appropriate method.

12.4 As per claims 14 and 16, **TO** teaches determining a mapping between the time or spatial domain description of the generalised nonlinear system and the frequency domain description of the generalised nonlinear system (CL7, L61 to CL8, L15); and

defining or determining a general relationship between the input and output frequency or frequency ranges of the generalised non-linear system (CL2, L31- L41).

TO does not expressly teach means for determining a mapping between the rime or spatial domain description of the generalised nonlinear system and the frequency domain description of the generalised nonlinear system; and means for defining or determining a general

relationship between the input and output frequency or frequency ranges of the generalised non-linear system. **PI** teaches means for determining a mapping between the rime or spatial domain description of the generalised nonlinear system and the frequency domain description of the generalised nonlinear system; and means for defining or determining a general relationship between the input and output frequency or frequency ranges of the generalised non-linear system (CL2, L50 to CL3, L47). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the system of **TO** with the system of **PI** that included means for determining a mapping between the rime or spatial domain description of the generalised nonlinear system and the frequency domain description of the generalised nonlinear system; and means for defining or determining a general relationship between the input and output frequency or frequency ranges of the generalised non-linear system. One would be motivated because the processor means would provide memory elements for retaining the energy state and processing capability for generating the modified energy signals from the received signals using appropriate method.

12.5 As per Claims 20, 21, 23 and 25, these are rejected based on the same reasoning as Claims 11, 12, 14 and 16, supra. Claims 20, 21, 23 and 25 are computer program product in a computer readable medium claims reciting the same limitations as Claims 11, 12, 14 and 16, as taught throughout by **TO, KE, MA** and **PI.**

12.6 As per Claim 29, it is rejected based on the same reasoning as Claims 11, supra. Claim 29 is a system claim reciting the same limitations as Claim 11, as taught throughout by **TO, KE, MA** and **PI.**

12.7 As per Claim 30, involving means for implementing methods of claims 1, 2, 4 and 6, it is rejected based on the same reasoning as Claims 11, 12, 14 and 16, supra. Claim 30 is system claim reciting the same limitations as Claims 11, 12, 14 and 16, as taught throughout by **TO, KE, MA** and **PI.**

12.8 As per Claim 31, comprising a data processing system as claimed in any of claims 11, 12, 14 and 16, it is rejected based on the same reasoning as Claims 11, 12, 14 and 16, supra. Claim 31 is system claim reciting the same limitations as Claims 11, 12, 14 and 16, as taught throughout by **TO, KE, MA** and **PI.**

12.9 As per Claim 32, it is rejected based on the same reasoning as Claims 11, supra. Claim 32 is an article of manufacture claim reciting the same limitations as Claim 11, as taught throughout by **TO, KE, MA** and **PI.**

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is

703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
April 13, 2004

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER